Report No. 052004/1

QUESTA TAILINGS FACILITY – REVISED CLOSURE PLAN

1.0 Introduction And Terms Of Reference

Molycorp, Inc. (Molycorp) owns and operates tailings impoundments located adjacent to the town of Questa, New Mexico. These impoundments contain the tailings from the Questa molybdenum mine, which is located 3.5 miles east of Questa. It is anticipated that these tailings facilities will be operated for at least another 20 years. However provision must be made for the eventual reclamation and closure of these tailings impoundments.

Under the terms of the approval granted by the Groundwater Protection and Remediation Bureau of the New Mexico Environmental Department (NMED) for Molycorps Discharge Plan (DP-933), Molycorp was required to prepare a Revised Closure Plan (RCP) for the Questa tailings impoundments. The schedule for submitting documents that support a revised closure plan for the tailings impoundments were to be as follows:

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i) Stage Two Investigation: December 1, 1996.

ii) Report on Stage Two Investigation: July 1,1997.

iii) Modeling and Cover Evaluation: November 1, 1997.

iv) Request for Modification, Revised Closure Plan; Adjusted Cost Estimate and Adjusted Financial Assurance Proposal; May 1, 1998.

Items i) to iii) were submitted to the NMED by the due dates. This Revised Closure Plan includes an Adjusted Cost Estimate for implementation of the closure plan and is submitted in partial completion of the submissions due May 1, 1998.

The Revised Closure Plan has been prepared to include the general requirements of the:

1. The Discharge Plan (DP-933),
2. "Closeout Plan Guidelines" dated June 1995 from the State of New Mexico Energy, Minerals and Natural Resources Department – Mining and Minerals Division (MMD).
3. Financial Assurance Regulations from the NMED dated May, 1996.

This Revised Closure Plan follows on two previous submissions on tailings dam closure:

1. "Final Closure Plan of Tailings Impoundment Area" dated December 15, 1993, and prepared by Molycorp, Inc. for the NMED

2. "Questa Mine Tailings Impoundment Contingency Closure Plan for 2001" dated August 1996, prepared for Molycorp by Robertson GeoConsultants Inc. in association with Steffen, Robertson & Kirsten (US) Inc. This plan was submitted as part of the 1996 Discharge Plan approval application.

This Revised Closure Plan builds on these earlier plans.

In Section 2 of this plan a description is provided of the site conditions and land-use prior to the development of the tailings impoundments. Section 3 describes the site development that has occurred with particular emphasis on the nature of the structures that have been constructed, the physical and geochemical characteristics of the tailings deposits, the tailings water management and measures implemented to protect the ground and surface water quality of the State. It then reviews the planned development for the projected facility life of 23 years. In Section 4 the Revised Closure Plan is defined as a set of eight closure plans as follows:

1. Surface Shaping Plan
2. Buildings and Clean-up Plan
3. Cover Placement Plan
4. Drainage Plan
5. Re-vegetation Plan
6. Groundwater Interception Plan
7. Monitoring and Maintenance Plan
8. Post Closure Land-use Plan

In Section 5 a closure cost estimate is prepared for the implementation of all the requirements contained in these plans. This closure cost estimate is the Adjusted Cost Estimate.

During the development of this closure plan meetings were held with the NMED to discuss the results of investigations, studies and alternatives evaluations on February 6th 1998 and March 31st, 1998, and a joint field inspection of vegetation growth was made on April 16th, 1998. As a consequence of these meetings Molycorp has made additions and modifications to some original closure plan measures.

2 Pre-Tailings Impoundment Development Conditions

2.1 Location and Climate

The Questa Tailings Facility is located near the village of Questa in Taos County, New Mexico (Figure 2-1). The village of Questa lies in an alluvial plain at an elevation of about 7600 feet a.s.l., bordered by the Sangre de Cristo Mountains to the east and the Guadalupe Mountains to the west. To the south of Questa, the Red River and its tributary, Cabresto Creek, have cut a prominent valley 100 to 200 feet below the level of the alluvial plain (Figure 2-1). To the north, the piedmont alluvial plain extends past the village of Cerro, and into Sunshine Valley.

The climate of the study area is semi-arid. Precipitation and temperature vary considerably in the area owing to differences in elevation and proximity to the nearby mountains. In general, average precipitation increases and temperatures decrease with increase in elevation from the alluvial plain and into the Sangre de Cristo Mountains. The nearest weather station to the Questa Tailings Facility is located at Cerro, only three miles north of Questa in the alluvial plain (altitude 7665 feet a.s.l.). Table 2.1 lists mean monthly values of precipitation, daily maximum and daily minimum temperature for this weather station.

Annual precipitation at Cerro averages 12.24 inches per year with much of this precipitation occurring as summer thundershowers (43% of total precipitation occurs from July to September). The summers are generally pleasant, with maximum daily temperatures in the low 80s and minimum temperatures in the low 40s. The winters are long with temperatures dropping below freezing almost every night from October through to April. However, typically clear skies bring sunshine during most days with temperatures rising to above the freezing point.

During the winter much of the precipitation falls as snow. However, fresh snowfall typically melts and/or sublimates within hours or days and a significant snow pack rarely develops. Owing to the low night temperatures and absence of a protective snow cover, the soils typically freeze during the winter. The depth of freezing (frost line) on exposed soils (e.g. on the tailings impoundments) is in the order of 18-24 inches (A. Wagner, pers. comm.).

Based on frost data collected by the U.S. Weather Bureau at Cerro a growing season of 120 days is average for the study area. However, cool season grasses, forbs and shrubs grow in spite of freezing temperatures at night, significantly extending their growing season (see below).

Unfortunately, pan evaporation is not recorded at the nearby Cerro weather station. Perhaps the most representative weather station in the area that measures pan evaporation is at Alamosa, Co, approximately 60 miles north of the study site. The potential (pan) evaporation rates are not expected to vary widely between Alamosa and Questa due to similar elevations and geographic location. The long-term averages for monthly totals of pan evaporation at Alamosa (for April to October) are also shown in Table 2.1. As expected for this semi-arid climate, the potential evaporation rates (measured as pan evaporation) far exceed precipitation rates during all months on record.

Table 2.1
Summary of Climate Data

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	TOTAL
Precipitation [(1)] (in inches) average for 1932 -1997	0.63	0.58	0.74	0.83	1.19	0.95	1.78	2.07	1.43	1.00	0.71	0.73	12.24
Minimum Daily **Temperature** [(1] (in degrees Fahrenheit) average for 1948 -1997	7.1	12.8	20.4	27.5	35.3	43.3	49.0	47.8	41.2	30.5	18.5	9.3	
Maximum Daily **Temperature** [(] (in degrees Fahrenheit) average for 1948 -1997	36.0	41.1	49.1	59.4	68.5	78.2	82.2	79.9	74.3	63.9	49.1	38.4	
Pan Evaporation [(2)] (in inches) average for 1960-I 997	n/a	n/a	n/a	7.40	8.79	10.4'	8.95	7.63	6.48	4.94	n/a	n/a	~ 65-70

Notes:
(1) data for Cerro, NM (elev. 7662')

Evapotranspiration rates for the study area are estimated to be in the order of 0.2 to 0.25 inches per day during the growing season (Anne Wagner, pers. comm.). Some evapotranspiration will also occur during the winter months, particularly in the afternoon when temperatures rise above freezing (much of the vegetation in the area is evergreen and transpires year-round).

2.2 Physiography and Surface Drainage

The Questa Tailings Facility is located in Taos County, 5 miles north-east of the confluence of the Red River and the Rio Grande (Figure 2-2). The study area is characterized by three prominent landforms: (i) a fault block mountain range, the Sangre de Cristo Mountains; (ii) a piedmont alluvial plain; and (iii) a lava-capped plateau (Figure 2-2). The Sangre de Cristo Mountains form the eastern border of the study region. Structurally, these mountains may be related to the Basin and Range province. The western base of the mountains has been mapped as a fault scarp. The bold western face of the mountains and the presence of fault scarplets and landslide talus at the foot of the range all suggest rapid uplift along a fault zone.

The piedmont alluvial plains are located to the west of the Sangre de Cristo Mountains (Figure 2-2). The piedmont alluvial plains are sloping plains formed at the base of a high mountain range and composed largely of detritus derived from the mountains and deposited in coalescing alluvial fans by many ancient streams. Much channeling of the piedmont alluvial plains has occurred in the past (commonly called "arroyos") and is continuing in the vicinity of Questa (Figure 2-3). Here, the Red River and its tributary, Cabresto Creek, have cut a prominent valley 100 to 200 feet below the level of the piedmont alluvial plain.

A relatively undisected plateau, largely capped by Servilleta basalt lava flows ("flood basalt"), comprises most of Taos County west of the Rio Grande (Figure 2-2). Shield type volcanoes (e.g. Brushy Peak) producing low viscosity lava were the source of the vast lava flows forming the plateau. The lava flows of the plateau slope generally eastward and interfinger with the alluvial sediments of the Piedmont alluvial plains to the east of the Rio Grande.

In the study region, the physiography is further complicated by the Guadalupe Mountain (Figure 2-3). The Guadalupe Mountain consists of a pair of volcanic exogenous domes and vent structures that have overlapped and sutured into one another. These volcanoes are generally older than the volcanoes of the lava-capped plateau and hence represented a barrier to the flow of flood basalt from the west. At the same time they represented a barrier to the movement of relatively young alluvial sediments from the east.

The original topography and drainage pattern prior to development of the Questa Tailings Facility is shown in Figure 2-3. The only two perennial streams in the study area are the Red River and Cabresto Creek. Both streams drain the western slopes of the Sangre de Cristo Mountains before entering the alluvial plain. Cabresto Creek flows into Red River just to the east of the village of Questa (Figure 2-3). The Red River enters the Red River Gorge two miles west of Questa and eventually drains into the Rio Grande. Peak flows in the Red River and Cabresto Creek are observed during snowmelt in the Sangre de Cristo Mountains (May and June).

The tailings impoundments were constructed in two deeply incised arroyos which run in a southwesterly direction towards the Red River valley (Figure 2-3). These arroyos drained the eastern slopes of the Guadalupe Mountains and the alluvial plain to the north. However, runoff from the Guadalupe Mountains and the alluvial plain is very low owing to the low precipitation in the area and the high permeability of the volcanics in the Guadalupe Mountains and surfical sediments in the alluvial plain. Hence the arroyos were likely dry during extended periods of time with intermittent stream flow only during intense summer thundershower activity producing short-duration, high peak floods.

2.3 Hydrology and Surface Water Quality

The hydrology of the area covered by the Questa Tailings Facility has been studied for the design of the East and West Drainage Ditches (also referred to as 'Diversion Ditches') (Vail, 1975). The location of the East and West Drainage Ditches, and their respective sub-watersheds are shown in Figure 2-3. Most of the drainage reporting to the lower portion of the west ditch is from the steep eastern slope of the Guadalupe Mountains. This mountainous drainage area extends from 7560 to 8667 feet a.s.l. with an average ground slope of 15%. The upper end of the west drainage ditch collects runoff from approximately 1100 acres of relatively flat, alluvial plain with generally a herbacious ground cover and soil types with fairly good hydrological characteristics (Vail, 1975). Approximately 320 acres of mountaineous land with characteristics similar to that along the lower portion of the west ditch, drains through the alluvial plain to the uppermost end of the ditch (Figure 2-3).

The drainage area of the East Ditch covers approximately 1060 acres, most of which lies between elevations of 7520 and 7800 feet a.s.l. (Figure 2-3). This drainage area is similar to the alluvial plain areas draining to the west ditch. The overall ground slope to the East Drainage Ditch is less than 2%.

Although both drainage areas contain a number of small arroyos, there is no major drainage channel in either area and a large section of the alluvial plain above the West Drainage Ditch does not have a defined drainage system (Figure 2-3). Early maps of the area show an irrigation canal ('Sunshine Canal') which apparently diverted flow from Cabresto Creek into the Sunshine Valley to the north (Figure 2-3). This irrigation canal has been abandoned, however, many years ago (Vail, pers. comm.).

According to isopluvials published by the U.S. Weather Bureau, the maximum 24 hour precipitation that can be expected in the drainage area once in every 100 years is 2.8 inches (Vail, 1975). Probable maximum 24 hour precipitation rates for other time periods are listed in Table 2.2.

Table 2.2.

Peak 24 hr Rainfall Rates for Drainage Area of Questa Tailings Facility (from Vail, 1975).

Return Period (in years)	**24 hour precipitation (in inches)**
2	1.2
5	1.6
10	1.8
25	2.1
50	2.4
100	2.8

The total runoff and peak rates of discharge from these two drainage areas have been computed based on procedures developed by the Soil Conservation Service (SCS) (Vail 1975). The total direct runoff from various portions of the drainage area was estimated to range from 0.45 to 1.2 acre inches per acre for the 1 in 100 year 24 hr storm event (Vail, 1975). The time it takes for runoff to travel from the hydraulically most distant part of the watershed area to the discharge point during a storm event was estimated to be in the order of 1.6 hours (Vail, 1975). Peak discharges for the 1 in 100 year precipitation event (2.8 inches) were estimated to be about 2070 cfs for the West Drainage Ditch and 450 cfs for the East Drainage Ditch (see also Appendix F).

Red River stream flows have been monitored by the U.S. Geological Survey at the Questa Ranger Station (just upstream of the confluence of the Red River with Cabresto Creek) from 1913 to the present (85 years). The drainage area above the Questa gauging station extends over 113 square miles of steep sided river canyon and high mountain country where precipitation occurrence and rainfall intensity are much higher than at the tailings pond drainage area. The highest peak instantaneous flow recorded at the Questa gauging station was 886 cfs suggesting that the peak flows estimated for the drainage areas of the east and west diversion ditch are very conservative (see Appendix F).

There is very little 'baseline' data available on water quality of the Red River (or other streams in the study area) pre-dating the development of the Questa Tailings Facility. At any rate, such baseline data would be of limited value only, since the water quality of the Red River has likely changed during the 30 years of tailings operation. Increased land use of the Red River watershed due to population growth, development of the region as a tourist destination, and other activities upstream of the Tailings Facility have all likely contributed to increases in suspended and dissolved solids to the Red River over those years. In addition long-term precipitation patterns and decrease in basin yield due to changes in vegetation may have caused possible water quality changes (Vail, pers. comm.). The impact of the Questa Tailings Facility on surface water quality is better evaluated by comparing present-day stream water quality upstream and downstream of the tailings impoundments (see Section 3.1.7).

2.4 Geology

Figure 2-4 shows the surficial geology of the study region. At the regional scale four major geological units have been identified (Scott Vail, 1987):

- recent alluvium (al): surficial alluvial deposits mostly derived from the Sangre de Cristo Mountains to the east;
- Servilleta flood basalt (svb), olivine bearing; grouped as upper (sbu) and combined middle and lower (sbl) members;
- volcanic flows of Guadalupe Mountain (gv); lobate dacite flows and olivine andesite; and
- old alluvium (al_{SF}): conglomerate, sandstone, and siltstone; mostly derived from mountains to the east.

The young, surficial alluvial sediments are exposed in the eastern parts of the study region (Figure 2-4). Older alluvial sediments are found at greater depths throughout the study region, typically interbedded with the andesite basalt flows of the plateau. These old 'Santa Fe sediments' are exposed on the canyon walls of the Rio Grande and the (lower) Red River (Winograd, 1959). The alluvial sediments beneath the valley are estimated to be about 3000' thick (McKinlay, 1956). However, the sediments deposited since the last period of volcanic activity thin out toward the west, and, near the contact with the eastward dipping lava flows, they are only a few feet thick.

The surficial alluvial sediments are composed of materials ranging in size from clay particles to cobbles 8 inches in diameter. Usually the alluvial sediments are unsorted, but locally they are fairly well sorted, and contain lenses of gravel, sand, or clay. Owing to the large range in possible degrees of sorting and coarseness of the alluvial sediments, the permeability of this material varies greatly. The old alluvial sediments located at greater depths are much less permeable than the surficial sediments and have to be considered aquitards at the regional scale (Dames and Moore, 1987).

The Servilleta flood basalts extend from near the ground surface to a depth of a few hundred feet over much of the plateau area west of the Guadalupe Mountain and along the Rio Grande and Red River gorges (Figure 2-4). These basalt flows were derived largely from molten lavas of low viscosity; hence they were able to spread out over the plateau in tabular sheets, often of large extent. The individual basalt lava flows are generally less than 50 feet thick and are locally interbedded with thin strata of volcanic ash. The sheets were cut by numerous vertical fractures, which formed during cooling of the lava. The rapid chilling of the tops and bottoms of individual flows, and later erosion, resulted in a rugged contact between the lava strata.

The permeability of the Servilleta flood basalts depends largely upon the extent of its fracturing and the bedding contacts of different flows, which act as high permeability layers. Vesicles do not seem to be an important medium for groundwater movement through the lava. Although small portions of a lava flow are commonly impermeable, the lava flow as a whole is capable of transmitting large quantities of groundwater (high formational permeability).

The lobate flows of the Guadalupe Mountains (gv) are exposed only in vicinity of the Guadalupe Mountain (Figure 2-4). However, at greater depths, they reach as far west as the Rio Grande canyon (note outcropping of Guadalupe volcanics near Cerro Chiflo and Big Arsenic Springs, Figure 2-4). The volcanic formations of Guadalupe Mountain rest on the Santa Fe alluvial deposits. The elevation of the top of the Santa Fe sediments beneath Guadalupe Mountain has not been ascertained; however, it probably is a few hundred feet beneath the water table.

The volcanic activity of Guadalupe Mountain has emplaced a variety of volcanic lithologic types including dacites, colluvial and surge breccias, rhyodacite and occasional cinder beds. Probably very few of the rock units are continuous over the study area. Bed orientations and thicknesses are chaotic, and units can not be easily correlated over any great distance (Dames and Moore, 1987). Fracture densities and orientations, which control groundwater flow in this area, appear to vary widely. Indications of high volcanic rock permeability have been observed in the vicinity of the Guadalupe Mountains (e.g. South Pass Resources, 1993; Dames and Moore, 1987).

A series of northwest to southeast trending faults, referred to here as the Red River Fault Zone, bisects the area along the southwestern toe of the Guadalupe Mountain complex (see Figure 2-4). West of the fault zone, the Santa Fe sediments have been uplifted. East of the Red River Fault Zone, the rock units are down-dropped several hundred feet relative to the west of the zone. An exception to this condition can be found in the Big Arsenic Springs area (Figure 2-4) where a lobate dacite flow followed and filled a paleo-valley (possibly an ancestral Red River valley) at a depth that is now a few hundred feet below the top of the Santa Fe sediments (Vail, 1993).

The eastern section of the Questa Tailings Facility was entirely constructed on recent alluvial sediments, whereas the western sections were constructed partially on alluvial sediments and partially on volcanic rocks of the Guadalupe Mountains (Figure 2-4). Beneath the tailings facility the basalt flows from the Guadalupe Mountains gradually dip eastward, interfingering and underlying the recent alluvial sediments. Further details on the local geology at the tailings site are provided in Section 2.5.2 (Site Hydrogeology).

2.5 Hydrogeology and Groundwater Quality

2.5.1 Regional Hydrogeology

The groundwater conditions differ significantly between the piedmont alluvial plains to the east and the Guadalupe Mountain area and the lava-capped plateau to the west. Surficial alluvial sediments form the principal aquifer(s) in the eastern parts of the study region (Figure 2-5). Shallow groundwater in the alluvial sediments in the study area typically occurs under water table conditions. The gradients under which the groundwater moves through the alluvial sediments range from approximately 0.01 to 0.04 feet/foot, or 50 to 200 feet to the mile (Winograd, 1959).

In the vicinity of Cerro, and southward towards Questa, the water table is typically 60 to 160 feet below ground surface, depending on local topography. Most irrigation and water supply wells in this area are completed in the surficial alluvium of recent age (less than 300 feet below ground surface). The specific capacity of these wells is typically less than 20 gpm per foot of drawdown (Winograd, 1959).

In the western parts of the study region, the volcanics form the principal aquifer (Figure 2-5). In the volcanics, groundwater movement is controlled by fracture permeability, lava flow-boundary permeability and to a lesser extent vesicular permeability (Dames and Moore, 1987). Beneath

Guadalupe Mountain and further to the west, groundwater in the volcanic aquifer occurs under water table conditions. However, where the volcanics are overlain by alluvial sediments of appreciable thickness (i.e. east of the Guadalupe Mountain) groundwater is often confined (Winograd, 1959). Owing to the high formation permeability of the volcanics, hydraulic gradients are typically much lower than in the alluvial sediments. Dames and Moore (1987) estimated gradients of approximately 0.0036 feet/foot, or 19 feet to the mile, in the Guadalupe Mountain area.

The water table in the volcanic aquifer(s) is typically several hundred feet below ground surface. The only two water supply wells presently completed in the deep volcanic aquifer(s) are operated by the Bureau of Land Management in the "Rio Grande Gorge Wild and Scenic River Area". One well is located at the BLM's headquarters and the other one is located at the Chiflo Campground. Both wells produce approximately 30 gpm and operate on a pressure-demand basis (Dames and Moore, 1987). A pump test conducted in a test hole completed in the deep volcanics at the toe of Molycorp's tailings Dam No. 4 indicated a specific capacity of approximately 250 gpm per foot of drawdown (South Pass Resources, 1993).

The interaction of shallow groundwater flowing in the sediments of the piedmont alluvial plains and the deep groundwater flowing in the volcanic aquifer(s) is of special importance for evaluating the groundwater flow conditions at the Questa tailings site. It is commonly observed that the water table in the alluvial sediments is over 100 feet higher than in the underlying volcanics (e.g. Winograd, 1959; South Pass Resources, 1993). The downward movement of groundwater is retarded by a confining layer of lower permeability material, consisting either of an alluvial silt or clay bed or the upper portion of the lava flow where the fractures have been filled with clay, sand and gravel (Winograd, 1959). This confining layer causes the great head differential between the upper alluvial aquifer and the deeper volcanic aquifer. Groundwater moves through this confining layer recharging the deeper volcanic aquifer below. The absence of springs at the surficial contact of the alluvial sediments and the volcanics, plus the similarity in chemical composition of the water in the volcanics to that in the alluvial sediments, are further evidence that water from the sediments moves into the underlying volcanics (Winograd, 1959).

Perched conditions, i.e. shallow groundwater flow on top of low permeability clay lenses and/or layers resulting in a zone of aeration, occur locally within the alluvial sediments but are not considered important at the regional scale (Winograd, 1959). The perched water conditions in the vicinity and down-gradient of Dam No. 1 are, however, very important in that they control the flow paths and mixing of the tailings pond seepage and the natural groundwater (see Section 3.2.5 and 3.2.6).

Groundwater in the study area generally moves from areas of higher elevation, i.e. recharge areas at the base of the Sangre de Cristo Mountains, to those of lower elevations, i.e. discharge areas along the Rio Grande and the Red River (Figure 2-5). The groundwater initially moves in a westerly direction through the alluvial sediments, which underlie most of the area receiving recharge, and drains eventually into the underlying, permeable volcanics. The Guadalupe Mountain complex evidently does not represent any barrier to flow and groundwater continues to move in a southwesterly direction beneath this mountain complex (Dames and Moore, 1987; see Figure 2-5).

Groundwater flow down-gradient of the Guadalupe Mountain is controlled primarily by hydraulic properties of volcanics (in particular lobate dacite flows from the Guadalupe Mountain complex) and by the sedimentary Santa Fe Formation (Dames and Moore, 1987). East of the Red River Fault Zone the water table is in very permeable volcanics and groundwater is discharging at natural discharge points in and adjacent to the Rio Grande and the Red River (Figure 2-5).

West of the Red River Fault Zone, however, the Santa Fe sediments are uplifted and placed in the flow path of the regional groundwater system. Owing to their low permeability the Santa Fe sediments act as an aquitard restricting groundwater flow from volcanic aquifers east of the fault zone to the Rio Grande and the lower 2 miles of the Red River (Dames and Moore, 1987).

An exception is the dacite filled paleo-channel within the Santa Fe sediments, which emerges at the Big Arsenic Springs complex. The dacite has a relatively high permeability and appears to be an avenue of higher flow through the Santa Fe sediments (Figure 2-5). This condition explains the presence of the approximately 18 cfs of groundwater discharge in the Big Arsenic Spring complex (Scott Vail, 1987).

The western flank of the Sangre de Cristo Mountains is thought to be the principal area of groundwater recharge in the study region. The Rio Grande and the Red River gorges are the principal areas of groundwater discharge. Both, groundwater recharge and discharge rates in the study region have been estimated by various authors.

Precipitation in the study area ranges from 14 inches or less below 8,000 feet of elevation to over 30 inches in higher elevations. However, only a small percentage of this precipitation will actually recharge the aquifers. McAda and Waseolek (1987) estimated that the annual recharge from percolation of precipitation in the Espanola Basin (immediately to the south of the study region) is no more than 0.28 inches per year in those areas covered by the Santa Fe Group formation.

Most of the recharge to the groundwater probably occurs from ephemeral and perennial streams running off the Sangre de Cristo Mountains (and related irrigation ditches), which upon leaving their mountain courses and entering the plateau area, lose much of their flow to permeable alluvial sediments. Other sources of recharge are leakage from arroyo flood flows, and infiltration of water pumped for irrigation. Most recharge is to the groundwater body in the alluvial sediments. Recharge to the volcanics occurs predominantly though leakage from the overlying alluvial sediments. Vail estimated that the total recharge to the study region is in the order of 50 cfs (Vail, 1988).

Groundwater discharge in the study region is predominantly through natural springs into and near the Rio Grande and the Red River. The spring flows have been estimated directly and indirectly using accretion measurements (during low flow periods) in these rivers. Dames and Moore (1987) provide a comprehensive review of springs flows and river accretion measurements. The results of their review are shown in Table 2.3

At the regional scale, the groundwater system appears to be in relative equilibrium (Dames and Moore, 1987). No major changes in spring flows and/or static water levels have been observed in the volcanics and alluvial aquifers as a result of pumping (for irrigation) and/or seasonal recharge. Only shallow wells show seasonal variations in water levels corresponding to seasonal recharge.

Table 2.3.

Summary of Accretion to Rio Grande and Red River (after Dames and Moore, 1987).

	Total Accretion	*Estimated groundwater contribution from study region*
Rio Grande		
Cerro Chiflo to Red River Fault Zone	22 cfs	11 cfs from east
Red River Fault Zone to Confluence	23 cfs	18 cfs from Big Arsenic Springs Complex plus 2 cfs from east
Subtotal	**45 cfs**	**31 cfs**
Red River		
Questa to Fish Hatchery	18 cfs	12 cfs from north
Fish Hatchery to Red River Fault Zone	10 cfs	7 cfs from north
Red River Fault Zone to Confluence	5 cfs	2 cfs from north
Subtotal	**32 cfs**	**21 cfs**
TOTAL	**77 cfs**	**52 cfs**

2.5.2 Site Hydrogeology

Molycorp Inc. has commissioned several field investigations since 1989 to evaluate the impact of tailings seepage on the water quality of the local aquifers. In 1993, five monitoring wells were installed down-gradient of the tailings impoundments by South Pass Resources Inc. (SPRI). The results of this field investigation are summarized in SPRI (1993). In 1994, four extraction wells and an additional monitoring well were installed down-gradient of the impoundments (SPRI, 1995). In the fall of 1997, an additional set of monitoring wells and extraction wells was completed under the supervision of Souder, Miller and Associates (SMA, 1997). During each field investigation, selected wells were pump tested to obtain estimates of aquifer transmissivity.

In the following section we summarize the results of these field studies as they relate to the hydrogeology at the study site. For a discussion of the impact of the Questa Tailings Facility on the local groundwater system the reader is referred to Section 3.1.5 (Seepage Interception

System) and Section 3.1.5 (Groundwater Monitoring). For a more detailed interpretation of the field investigations the reader is referred to the cited literature.

Figure 2-6 shows an idealized cross-section running perpendicular to the two arroyos (parallel to the Red River) downgradient of the tailings facility. The exact location of the section line (and the various boreholes) are shown in Figure 3-14. Figure 2-6 illustrates the site geology and local groundwater flows. Table 2.4 summarizes the results of pump or bail tests conducted on selected wells to obtain estimates of aquifer transmissivity.

As a first approximation, the local groundwater system can be divided into an upper (shallow) aquifer system (above an elevation of ~7200 ft) and a lower (deep) aquifer system (below an elevation of ~7200 ft). The two aquifer systems may be characterized as follows:

- the shallow aquifer system consists of a complex mixture of recent alluvial sediments, ranging from coarse, permeable sand and gravel units to very low permeable clay layers (see Figure 2-6 and Table 2.4) resulting in very high spatial heterogeneity at the local scale; these alluvial and alluvial/lacustrine sediments contain thin layers of silt and clay which extend laterally (in a north-south direction) up to several hundred feet (see Photo 13);
- groundwater in the shallow aquifer system preferentially moves in permeable sand and gravel units of limited extent; it is difficult to isolate distinct aquifer units at this scale (note that SPRI has postulated the presence of an upper and lower aquifer separated by a middle aquitard; however, the lateral extent of these units is difficult to trace in the existing borehole logs); shallow groundwater is typically perched, flowing on top of silt and clay layers and gradually 'cascading' downward into deeper soil horizons (Figure 2-6);
- groundwater flow in the shallow aquifer system is predominantly in a south-southwesterly direction discharging in various springs at or near the Red River (e.g. Big Springs including Questa Springs); some shallow groundwater percolates downward and into the deeper aquifer system (leakage);
- the deep aquifer system consists of deep alluvial sediments in the eastern parts and volcanic rocks from the Guadalupe Mountains in the western parts of the study area (beneath the Dam 4 arroyo) (Figure 2-6); the basalt flows from the Guadalupe Mountains gradually dip eastward, interfingering and underlying the recent alluvial sediments beneath the Dam 1 arroyo (Figure 2-6); the volcanics have a very high secondary permeability (e.g. MW-11, Table 2.4) and act as a drain for shallow groundwater flowing above in the shallow alluvial sediments (Figure 2-6);
- groundwater flow in the deep aquifer system is predominantly in a southwesterly direction discharging in various springs in the Red River Gorge (much of this flow is collected in the warm water supply for the Fish Hatchery; see Section 3.2.7); deep groundwater moves through permeable sand and gravel layers of the deep alluvial sediments and fractures and bedding planes in the volcanics; the deep aquifer system appears to be unconfined with a water table near or below the level of the Red River (Figure 2-6);
- groundwater flow in the shallow aquifer system is influenced by seasonal recharge with seasonal water level fluctuations in the order of 1-2m; groundwater flow in the deep aquifer

system is at steady-state, i.e. seasonal variations in observed water levels are minor (in the order of 10-20 cm).

Note that the observed heads in the shallow aquifer system are many tens of feet higher than in the deep aquifer system (compare e.g. water levels in EW-4 and MW-14 to those in EW-2 and MW-12, Figure 2-6). The difference in permeability of shallow alluvial sediments and the units in the deep aquifer alone can not explain these very high vertical gradients. It is believed that shallow groundwater flow is locally perched due to the presence of silt/clay lenses and layers maintaining such a high head differential.

Note also that the local stratigraphy is complicated by a set of two (possibly more) faults (Figure 2-6). Vail (1987) mapped a northeast trending high angle fault along the east flank of the Guadalupe Mountains). This fault appears to follow the arroyo, now largely covered by the tailings behind Dam No. 4 (Figure 2-5). Field reconnaissance suggests that the fault block to the east has moved relatively downward (SPRI, 1995). East of this fault line, the basalt flows of the Guadalupe Mountains are exposed at the surface covered only by a thin veneer of soil derived from weathering of the local volcanics (Figure 2-6).

A second high angle fault line runs along the center of the northeast trending arroyo, now largely covered by the tailings behind Dam No. 1 (Figure 2-6). The borehole logs suggest that the volcanic unit has been displaced downward to the east of this fault line (SPRI, 1993). This fault line acts as sharp boundary between different stratigraphic units (Figure 2-6).

Note that the borehole data and field exposures are concentrated in a narrow band to the south of Dams No. 1 and No. 4. It is believed, however, that the structure and lithologic units, particularly the basalt unit, extend northward beneath the tailings pond facility and southward at least to the Red River (SPRI, 1993).

2.5.3 Groundwater Quality

The earliest records of groundwater quality in the study area are published in Winograd (1959). He noted that the groundwater quality in the area was good to excellent with low hardness (less than 100 mg/l $CaCO_3$) and low concentrations of sulfate (~20 mg/l), fluoride (<1.2 mg/l) and total dissolved solids (TDS<160 mg/l). Furthermore, it was observed that the quality of groundwater in the shallow alluvium and the deep volcanics was nearly the same.

These early measurements were later confirmed by sampling groundwater in a number of wells and springs upgradient or out of the flow path of tailings seepage from the Questa Tailings Facility (e.g. Dames and Moore, 1987). Table 2.5 lists water quality parameters for those wells with natural ambient groundwater quality in the study area (after Vail, 1993). The natural groundwater in both the shallow and deep aquifers has a near-neutral pH with low concentrations of dissolved solids (140-150 mg/l TDS). The water is generally soft with most of its hardness derived from calcium carbonate. Sulfate concentrations in the natural groundwater are about 20 mg/l and ambient concentrations of molybdenum are below the detection limit (Table 2.5).

Table 2.4.

Results of Pump Tests near Tailings Facility.

Borehole	Aquifer Material	Method	Transmissivity		Saturated	Hydraulic Conductivity		Reference
			g/d/ft	m^2/s	Thickness (ft)	$g/d/ft^2$	cm/s	
MW-7a	sandy gravel	Cooper - recovery	2,500	3.6E-04	10	250	1.2E-02	
MW-10	gravelly sandy clay	Cooper - drawdown(1)	9	1.3E-06	50	0.18	8.5E-06	SPRI, 1993
	w/ thin layers of	Cooper - recovery(1)	2	2.9E-07	50	0.04	1.9E-06	
	sandy gravel	Specific Capacity Test (1)	51	7.3E-06	50	1.012	4.8E-05	
MW-11	volcanics	Cooper - drawdown	1,932,000	2.8E-01	56	34,500	1.6E+00	SPRI, 1993
		Cooper - recovery	784,000	1.1E-01	56	14,000	6.6E-01	
		Specific Capacity Test	383,700	5.5E-02	56	6,852	3.2E-01	
EW-2	sandy gravel	Cooper - drawdown	2,600	3.7E-04	30	87	4.1 E-03	SPRI, 1994
		Cooper - recovery	27,000	3.9E-03	30	900	4.2E-02	
EW-3	gravelly clay and	Cooper - drawdown	4,400	6.3E-04	15	293	1.4E-02	SPRI, 1994
	clayey gravel	Cooper - recovery	2,200	3.2E-04	15	147	6.9E-03	
EW-5A	sand w/ gravel	Cooper - drawdown(1)	5,793	8.3E-04	30	193	9.1 E-03	SMA, 1997
EW-5B	gravelly sand; silty g	Cooper - drawdown(1)	70,026	1.0E-02	30	2,334	1.1E-01	
EW-5C	silty, gravelly sand	Cooper - drawdown(1)	1,082	1.6E-04	30	36	1.7E-03	
EW-5D	silty sand	Cooper - drawdown(1)	43	6.2E-06	25	2	8.1 E-05	

Notes:

(1) maximum drawdown was not reached

Table 2.5

Ambient Natural Groundwater Quality

WATER SOURCE	LOCATION Sec	Twp	Rng	AGENCY	DATE	SPEC. COND. umhos	TDS mg/l	pH units	SO4 mg/l	CALCIUM mg/l	MAG-NESIUM mg/l	CHLORIDE mg/l	FLOURIDE mg/l	IRON ug/l	MANGANESE ug/l	MOLY-DENUM ug/l	ZINC ug/l
Big Arsenic Springs	a	28	12	USGS	10-07-80	228	161	8.2	22.0	18.0	4.8	6.9	---	<10	2	<10	- - -
Big Arsenic Springs	8	28	12	USGS	08-20-82	220	159	7.9	22.0	20.0	5.1	6.8	1.2	4	3	- - -	13
Big Arsenic Springs	8	28	12	EID	01-13-83	226	162	7.5	23.7	18.0	5.7	8.0	---	---	<10	---	<50
Big Arsenic Springs	8	28	12	EID	07-23-84	- - -	160	---	24.8	16.3	5.6	6.0	---	<50	<10	<50	<50
Big Arsenic-North Springs	8	28	12	EID	01-13-83	229	163	7.5	23.7	19.4	5.4	8.0	---	---	---	<10	<50
Big Arsenic-Meadow Springs	8	28	12	EID	01-13-83	192	163	7.5	23.7	19.4	5.4	8.0	---	---	<10	- - -	<50
Big Arsenic-Meadow Springs	8	28	12	EID	11-08-84	---	154	---	29.6	22.4	7.8	6.3	1.2	<100	<50	<10	<50
Big Arsenic-Meadow Springs	8	28	12	EID	05-30-85	---	165	---	24.5	24.0	8.3	8.6	---	110?	<50	<10	<10
Big Arsenic-High Springs	8	28	12	EID	11-08-84	---	---	---	---	21.6	3.9	---	1.08	480?	<50	<10	- - -
Big Arsenic-High Springs	8	28	12	EID	05-30-85	247	170	- - -	24.5	11.2	20.0	6.8	- - -	<50	<50	<10	---
Chiflo Springs				EID	05-30-85	218	---	---	26.6	22.5	17.6	7.0	- - -	- - -	---	---	- - -
BLM Visito Center Well	9	28	12	USGS	08-20-82	220	156	7.9	20.0	19.0	5.0	7.0	1.2	7	3	---	48
BLM Chiflo Wells	9	28	12	USGS	08-20-82	220	158	8.0	23.0	19.0	5.2	6.9	1.3	3	10	---	97
Mottle Spring-Red River	9	28	12	USGS	08-19-82	220	- - -	7.5	- - -	---	a - -	---	---	3	8	6	<3
Warm Spring-Red River	9	28	12	EID	02-21-84	- - -	164	- - -	21.7	24.0	5.9	9.7	---	---	<10	- - -	<100
MC Guadalupe Well 4 (Average of 7 samples)	22	29	12	MC	12-87	- - -	167	7.5	50.1	20.5	4.9	8.7	1.1	5	2	<2	150
MC Guadalupe Well 5 (Average of 5 samples)	33	29	12	MC	ii-as	---	167	---	18.8	20.4	5.4	7.6	1.1	3	14	<2	40
ALLUVIUM WELLS																	
Top of World Farm	35	1	74		1955	217	136	7.7	8.8	24	5.7	5.0	0.8	---	- - -	- - -	- - -
Anderson Well	16	12	30		1954	194	---	7.2	---	---	- - -	4.5	---	---	- - -	- - -	- - -
Carter Farm	24	12	30		1954	190	---	---	43	36	2	18	---	---	---	- - -	- - -

2.6 Soils, Vegetation and Wildlife

2.6.1 Soils

Soils in the area of the tailings facility prior to operation of the ponds have been identified from the 1976 Soil Survey of Taos County. The soil descriptions indicate conditions prior to placing of tailings. Figure 2-7 indicates the location and soil types by abbreviation. In addition, the information is important to the closure of the facility because borrow areas for covering the tailings are located in and around the tailings ponds. Identification and descriptions of the soils allow for planning of the final reclamation of the site. The descriptions of the various soils in the area have been verified informally by staff at Molycorp, based on their experience with the borrow areas at the tailings facility.

There are three soil types identified at the tailings facility that make up the majority of the site. Three additional soil types occur in a much smaller area at the tailings. The three major soil types are identified as 1) Sedillo-Silva Association (SED); 2) Fernando Cobbly Loam (FaC); and 3) Rock Outcrop-Raton Complex (RRE). The minor soil types are the Fernando Clay Loam (FfC), Manzano Clay Loam (MnC), and Silva Loam (SmB). The soil descriptions are summarized below, with only the major components of a unit discussed and focusing on characteristics that are important to its use as a cover material. For complete descriptions of the soil classifications, refer to the Soil Survey of Taos County.

Sedillo-Silva Association: The Sedillo is a very gravelly loam and makes up about 55% of the association and is found on side slopes in the region. The Silva loam makes up about 25% and is found on ridge crests. Because of the location of each type, it is anticipated that the Sedillo soil is the most likely to be used for cover material in this association. Also making up this association are Orthents and Manzano, Fernando, and Hernandez soils (each at 5%). The Sedillo soil is well drained with an effective rooting depth of 60 inches *in situ*. When the soil is classified by layers (which is lost during the use of the material as cover) the top 5% is very gravelly loam, 13% is very gravelly clay loam and the remaining 82% (to 60 inches) is very gravelly sandy loam. The available water capacity ranges from low to moderate. The Silva soil is loam and clay loam with a similar rooting depth.

The Fernando Cobbly Loam is found on alluvial fans at the base of mountains and formed in mixed alluvium. Included in the mapping units are Fernando loam (10%), Hernandez soils (15%) and Rock Outcrop (5%). The soil is generally cobbly loam (5%), loam and clay loam (33%) and loam (62%). The effective rooting depth is a minimum of 60 inches *in situ*. Cobbles and gravel cover 15 to 35% of the surface. The available water capacity is high and the soil is noted to be suitable for juniper and pinon.

The last major soil type in the area, the Rock Outcrop-Raton Complex is unlikely to be used for cover material. It includes areas of rock outcrop and Raton very stony silt loam intermingled. Included in this association are Orthents and Stunner soils which make up 15% of this complex. The rock outcrop consists of folded, broken and exposed basalt flows. The Raton soil is shallow, only 18 inches deep, and formed in the residuum of basalt and in mixed eolian sediment. The top four inches is very stony silt loam and the lower 14 inches is very stony clay. The effective rooting depth is 18 to 20 inches *in situ* and it is suitable for woodland growth. However, because of the shallow soil and stony nature of the complex, it is unlikely to be cost effective to use this material as a cover material.

The minor soil types are considered those which occur at the tailings facility in lower percentages relative to the three major soil types previously discussed. The Fernando Clay Loam is a deep, well-drained soil that formed in alluvium on alluvial fans. Individual areas are 5 to 40 acres in size. About 15% of the unit are small areas of Silva and Hernandez soils. The surface layer is generally brown clay loam about 5 inches thick. The subsoil is brown silty clay loam about 14 inches thick and the remaining depth to 60 inches is made up of light brown silt loam. The soil may be somewhat calcareous, has an effective rooting depth of at least 60 inches, and the available water capacity is high. The soil has medium potential for use as habitat for openland and rangeland wildlife.

The next soil type is Manzano Clay Loam, which is formed in mixed alluvium along arroyo channels and range in size from 5 to 160 acres. There are some areas of gravelly soils and a few areas of intermingled Caruso and Tenorio soils (up to 15%). The surface 10 inches is generally brown clay loam, with about 33 inches of dark brown clay loam and the remaining 37 inches is brown clay loam. The available water capacity is high and the effective rooting depth is at least 60 inches. The dominant vegetation *in situ* is blue grama, big sagebrush and western wheatgrass. This soil has moderate potential for use as rangeland wildlife.

The last soil type in the region is the Silva Loam. This soil formed in mixed alluvium and eolian sediment on upland fans and ridges. Included in this soil are Fernando and Sedillo soils, which make up about 10% of the type. The top 8% is typically brown loam, the next 42% is brown clay loam and the remaining 50% to 60 inches is pink clay loam. The effective rooting depth is at least 60 inches and available water capacity is high.

2.6.2 Vegetation

The pre-existing vegetation prior to establishment of the tailings ponds has been determined indirectly. By examination of air photos (prior to 1965), talking to long-time residents of Questa and looking at the soils and topography in the area, the vegetation in the area has been identified as primarily pinon-juniper woodland in combination with sagebrush. The bottom of the arroyos were mainly grasses with some woody vegetation. As further confirmation of the pre-existing vegetation descriptions, the ecosystems surrounding the Questa tailings facility are of the same two types, the sagebrush ecosystem and the pinon-juniper ecosystem. A general description of the two ecosystems follows and are summarized from recognized descriptions of range and forest ecosystems (Eyre 1980, Garrison et al. 1977).

The sagebrush ecosystem (Photo 22) generally occupies plains and plateaus derived from lava flows, ancient lakebeds and broad basins of alluvium. The length of the frost free season ranges from 80 to 120 days with precipitation ranging from 5 to 12 inches, although some areas with as much as 20 inches of precipitation are found. The site is dominated by sagebrush (*Artemesia spp.*) and other shrubs may make up a part of the community. Sagebrush is also found as the only shrub with the understory made up of wheatgrasses, fescues, bromes, etc. The soil types are generally Aridosols, may have no pedogenic horizons and are typically low in organic matter.

Animals which generally occupy the sagebrush ecosystems include mule deer (winter use primarily), gophers, coyotes, jackrabbits, and rats. Bird populations are generally low during the breeding season with an average of 25 pairs for 100 acres. Major influent birds include red-tailed hawk, Swainson hawk, owls, and eagles.

The pinon-juniper woodland (Photo 21) is considered a climax community found in areas characterized by low precipitation, low relative humidity, hot summers with high evaporation rates and clear weather with intense sunlight. This type is often flanked by desert shrub (e.g., sagebrush) communities. Generally, the pinon-juniper type occupies the rocky or rough terrain, while sagebrush or other species occupy the gentle portions. Soil types associated with pinon-juniper woodlands include Aridosols with pedogenic horizons and moderate to low organic matter.

Some species found in association with pinon-juniper, particularly in well-developed (12 inches) soils include big sagebrush, western wheatgrass, blue grama, cliffrose, bitterbrush and Indian ricegrass. As the canopy closes, or on soils with low water holding capacity, grass production is reduced, shrubs spread out and the closure of canopy may eventually eliminate the understory.

Animals associated with pinon-juniper woodlands include mule deer, coyote, bobcat, and elk may be locally important. Also found are the wood rat, cliff chipmunk, jackrabbit, porcupine and gray fox among others. Some of the birds found in the pinon-juniper ecosystems include gray titmouse, Woodhouse's jay, red-tailed hawk, pinon jay, and rock wren.

2.6.3 Wildlife

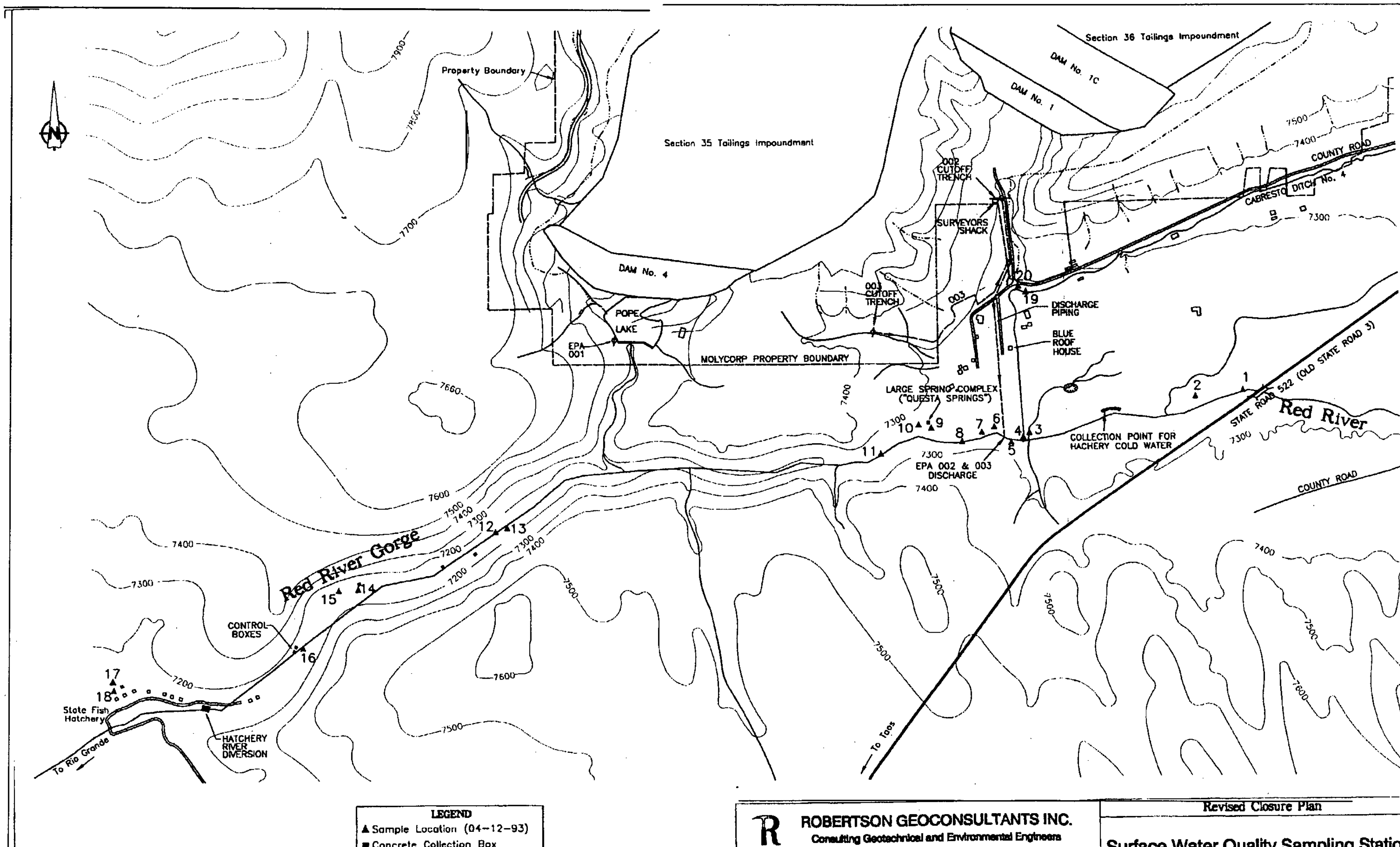
Wildlife occurrence and use of the area was described as part of the site assessment completed to meet requirements under the New Mexico Mining Act. The site assessment included both the tailings facility and the mine site. The information from that site assessment is summarized for this report (1994 Molycorp – Mining Operation Site Assessment, ENSR Consulting and Engineering). A wide variety of animals have been noted in and around the tailings facility. It is not expected that usage of the area prior to tailings placement was different from what is seen surrounding the area currently. The general descriptions of wildlife use of pinon-juniper woodlands and sagebrush communities are consistent with the descriptions for this site.

Mule deer may use habitats near and particularly west of, the tailings ponds and the elk use patterns typically parallel mule deer, and elk have been spotted west of the tailings ponds. Bobcat, coyote, gray fox, raccoon, and ringtail have been found within the tailings ponds. Black bear and mountain lion are limited in numbers but have been reported just west of the tailings ponds. Small mammals include white-tailed jackrabbit, Ord's kangaroo rat, deer mouse and chipmunk.

In 1986, 133 avian species were recorded near the tailings facilities. Raptors are found throughout the area and are represented by species such as the red-tailed hawk, American kestrel, great-horned owl, and saw-whet owl. Amphibians and reptiles found in the area included the western spadefoot toad, leopard frog, collard lizard, great plains skink, and prairie rattlesnake. Threatened or endangered species in the area include the bald eagle and whooping crane. Wintering bald eagles are known from the upper Rio Grande Gorge to the west of the tailings ponds. The whooping crane may potentially pass through the area during migration but is not expected to use the habitat.

2.7 Roads and Land-use

The site where the tailings impoundments are located was made up of two large arroyos draining towards the Red River. The presence of the arroyos limited the uses of the site. There was no known agricultural use of the area, although it was probably used for some sheep and/or cattle grazing. It is expected that wildlife in the area made use of the two arroyos. There were no maintained roads at the site, and it is believed that if any roads existed they were primitive roads or dirt tracks.



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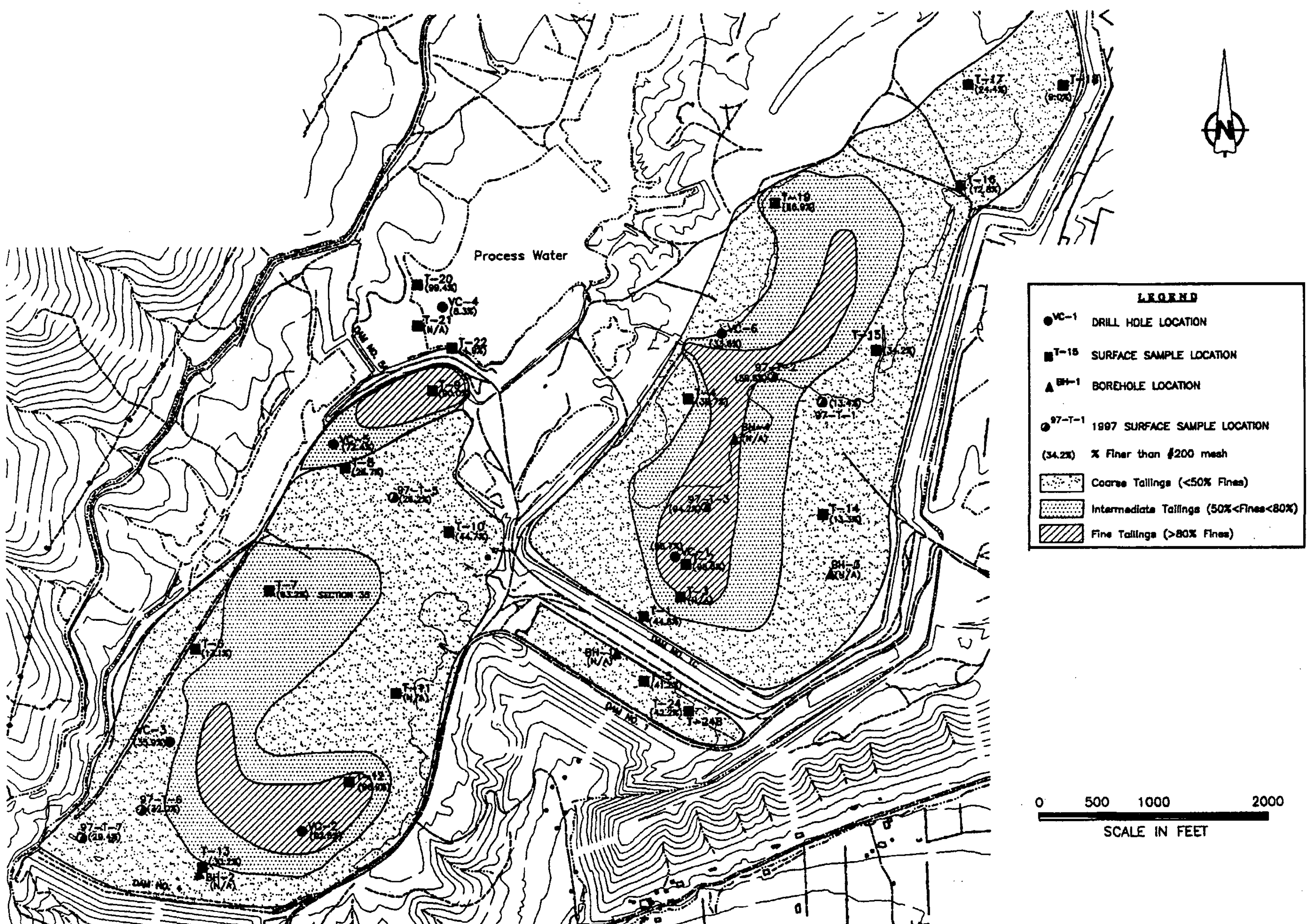
MOLYCORP
Questa, New Mexico

Revised Closure Plan

Surface Water Quality Sampling Stations
(after Vail 1993)

PROJECT NO.	DATE	SCALE	APPROVED	FIGURE
052004	March 1998	1"=900'		3-17

000960



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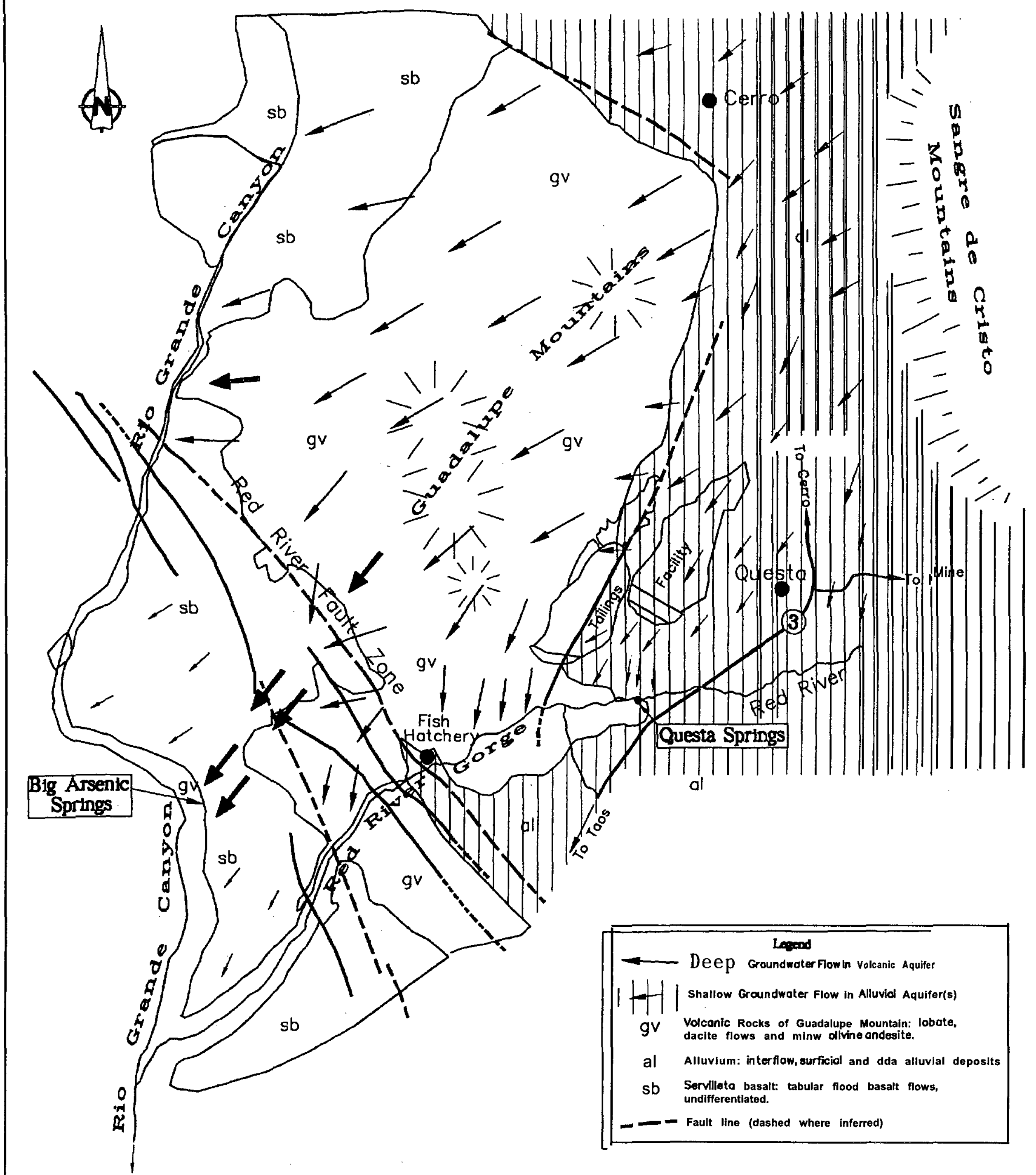
Tailings Characterization Plan

PROJECT NO.	DATE	SCALE	APPROVED	FIGURE
052004	March 1998	1"=1200'		3-8

000961



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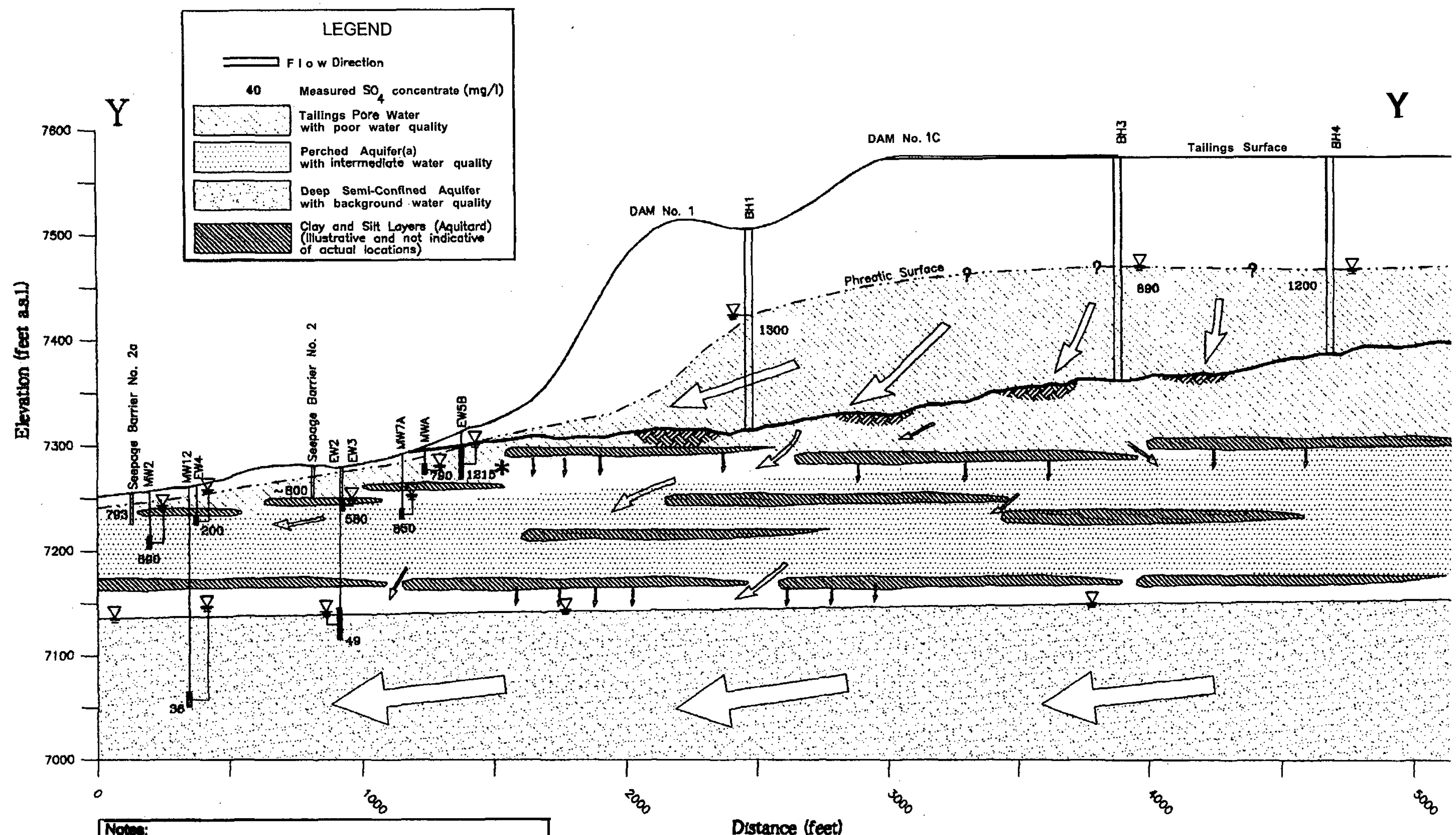
Regional Groundwater Flow

PROJECT NO.	DATE	SCALE	APPROVED	FIGURE
052004	March 1998	1"=5700'		2-5

\acad_questa\Questa-Final Report\2-5 Reginal GroundwaterFlow Thu Apr 23 11:40:49 1998 L. du Toit



Notes:

1. Sulphate in Monitoring Wells fmm September 1997
2. Sulphate in Boreholes from December 1996
3. Subsurface hydrogeologic interpretation is illustrative of interpreted conditions and not a reconstruction of known layering.

* ~880 mg/l after 4 months of pumping

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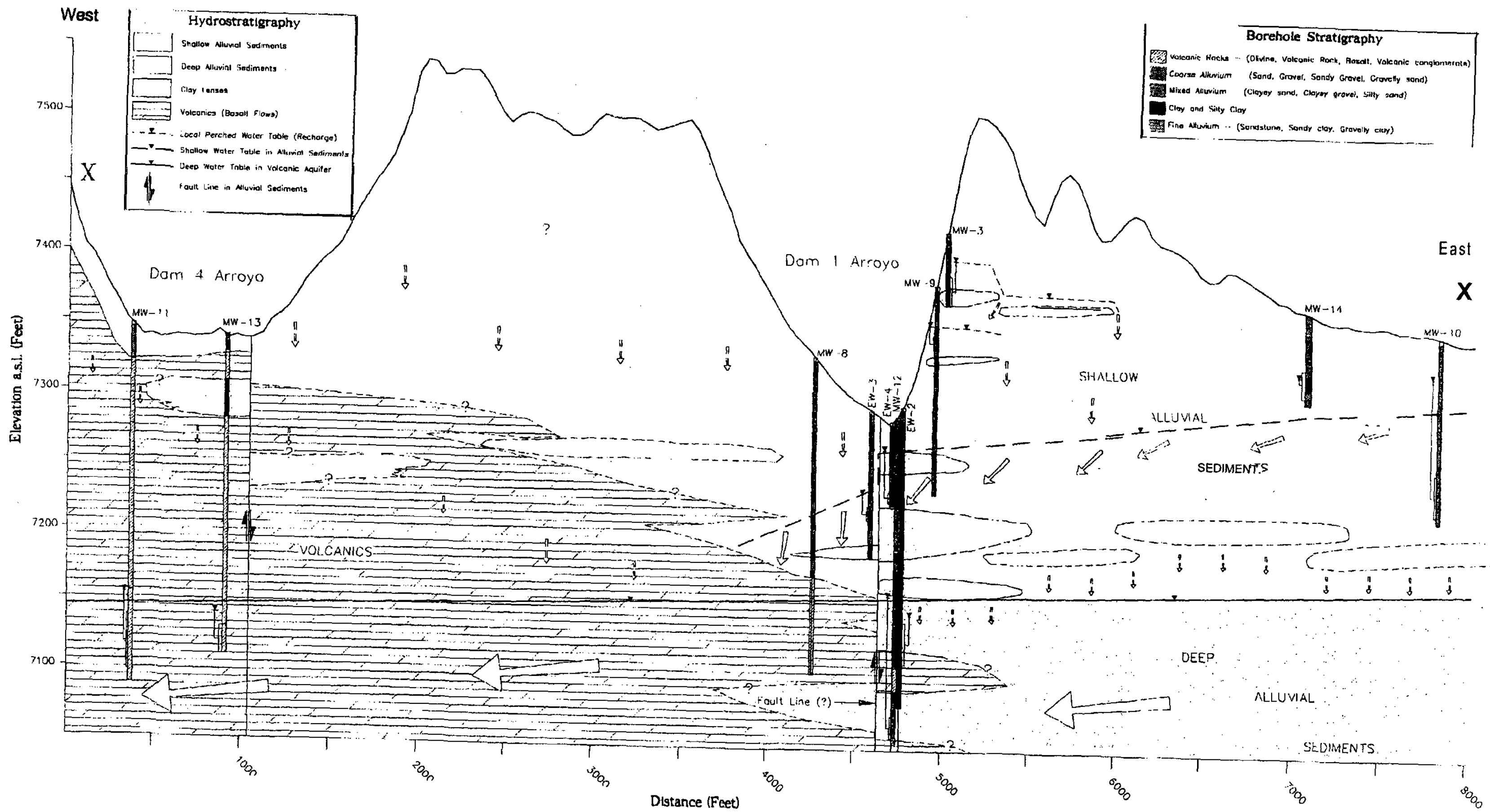
Questa, New Mexico

Revised Closure Plan

Conceptualization of Tailings Seepage

PROJECT NO.	DATE	SCALE	APPROVED	FIGURE
052004	April 1998	1"=550'		3-16



Note:
1. For location of cross section X-X' see figure no.
2. Stratigraphy inferred where borehole data missing (dashed lines).

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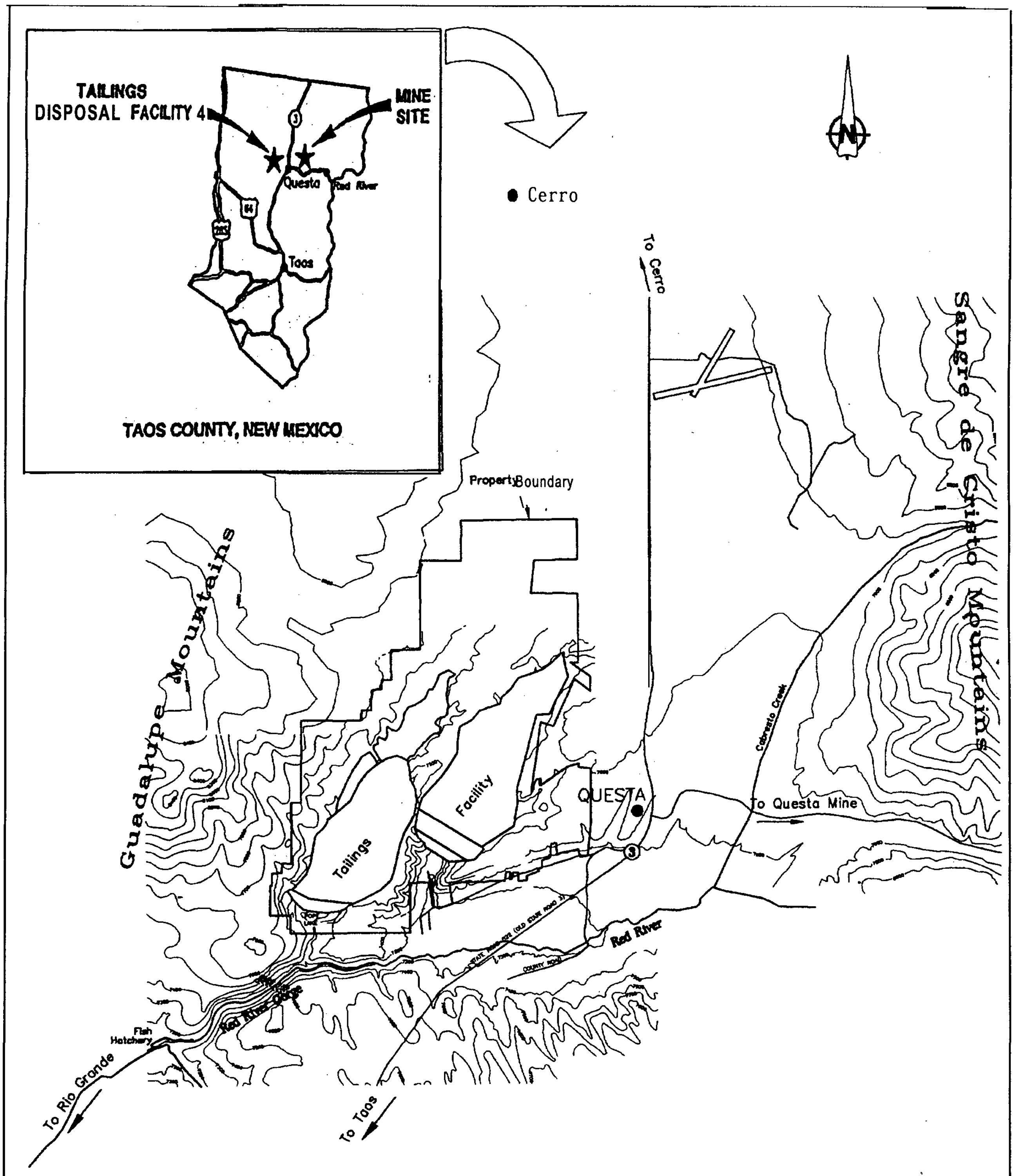
Revised Closure Plan

Hydrogeological Cross-Section

PROJECT NO.	DATE	SCALE	APPROVED	FIGURE
052004	April 1998	1"=550'		2-6

000964



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MOLYCORP
Questa, New Mexico

Revised Closure Plan

Location Map
Tailings Impoundments

PROJECT NO.	DATE	SCALE	APPROVED	FIGURE
052004	Feb. 1998	1"=4300'		2-1

\acad_questa\Questa-Final Report\2-1 location-map-new Tue Apr 28 08:34:52 1998 L. du Toit